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Stop device for a spindle drive

The invention relates to a stop device for a spindle drive, which consists of a threaded spindle and a spindle nut with a stop, the stop device comprising a limit stop, according to the preamble of claim 1.

In general, such spindle drives with corresponding stop devices are used in vehicle construction for adjusting individual elements relative to one another, where a threaded spindle or the like, which is driven remotely, runs in a spindle nut or the like. At the end of its thread, the threaded spindle here comes to a stop against the spindle nut in a limit stop position. However, this running up against the spindle nut takes place dynamically and leads to the possibility of the rotating threaded spindle becoming clamped with the spindle nut. When performing a backward adjustment, for example, it is not possible for the threaded spindle to be released from this clamped state in a noise-free manner. Release from the clamping position which has possibly arisen takes place jerkily and leads to significant noise being generated. It is precisely when using the spindle drive just described, for example for the vertical and longitudinal adjustment of an electrical steering column in a vehicle, that it is thus possible for the threaded spindle and spindle nut to be clamped with one another as described above should they run up against one another into a limit position, and they generate considerable release noise when being released from the limit stop position. However, for reasons of comfort alone, this release noise is unwelcome in vehicle construction. The use of simple elastomeric dampers at the limit stop to prevent clamping and to prevent the noise which then occurs during release is not possible at the position described, since the forces occurring are too great and

would damage corresponding elastomeric dampers.

It happens to be the case, however, that document DE 43 30 367 A1 discloses an adjustment device for the longitudinal adjustment of a seat in a motor vehicle, this device making use of a spindle drive comprising a threaded spindle and a spindle nut, a low-noise operation of the said adjustment device being ensured in this case by the arrangement of a spring element which acts in the direction of the spindle axis, this spring element being supported with prestress, on the one hand, against a shoulder of the threaded spindle and, on the other hand, against a threaded shoulder of a bearing element that faces and is directly opposite this shoulder. In this case, the spring element described in the said document is preferably formed by a prestressed spring assembly. Although this known adjustment device can produce a low-noise operation, the said device is structurally very complicated and also requires a high overall space requirement, particularly in the axial direction of the threaded spindle.

It is thus an object of the present invention to provide a stop device for a spindle drive which overcomes the disadvantages of the prior art and, in particular, offers low-noise operation of the spindle drive combined with a simple structure and relatively small overall space requirement.

The object is achieved according to the invention by a stop device for a spindle drive as claimed in claim 1. Further preferred embodiments of the invention are defined in the dependent subclaims.

The stop device according to the invention for a spindle drive, which consists of a threaded spindle and a spindle nut with a stop, comprises a limit stop and

also a faceplate according to the invention which is arranged between the stop of the spindle nut and the limit stop, the limit stop and the stop of the spindle nut being offset in relation to one another and being able to act upon the faceplate such that a bending moment can be applied to the faceplate according to the invention.

According to the invention, the use of a relatively simple faceplate according to the stop device according to the invention, this faceplate being arranged between the stop of the spindle nut and the limit stop, thus provides a structurally simple possibility whereby the faceplate according to the invention and its spring action produce a soft release from the stop position of the threaded spindle and spindle nut and thus do not cause any noise to be generated. At the same time, the faceplate according to the invention requires only a small amount of space. The effectiveness of the stop device according to the invention results from the stop of the spindle nut and from the limit stop which are offset in relation to one another, the faceplate there being arranged between them according to the invention. Consequently, a bending moment can be applied to the faceplate at least in one limit position.

In a preferred embodiment of the invention, the faceplate according to the invention is oriented perpendicularly to the axis defined by the shaft of the threaded spindle. In this way, and by contrast with the prior art, there is no need for a complicated prestressed damping element, and, preferably according to the invention, a faceplate thus positioned requires particularly little space. Nevertheless, good supporting and damping action is preferentially provided when the threaded spindle and spindle nut are in the limit stop position relative to one another.

In a particularly preferred embodiment of the stop device according to the invention, the stop of the spindle nut and the limit stop are arranged coaxially about the axis defined by the shaft of the threaded spindle. This requires only a very small amount of overall space.

The stop device according to the invention can, particularly preferably, be configured such that the stop of the spindle nut has a first diameter and such that the limit stop has a second diameter, the first diameter being larger than the second diameter. By virtue of the fact that the faceplate according to the invention can be supported against the corresponding stops of different diameter in the limit stop position, wedging of the threaded spindle and spindle nut relative to one another is also particularly preferably avoided.

In a particularly compact and yet simple-to-implement embodiment of the stop device according to the invention, the faceplate is mounted on the limit stop.

The faceplate according to the invention particularly preferably consists of an elastic material, preferably of metal, and most preferably of spring steel. It is possible in this way for the forces occurring to be handled in a particularly simple manner without any damage or breakage being caused to the faceplate provided according to the invention of the stop device according to the invention.

Further features and advantages of the present invention will be explained in more detail by way of example with reference to the drawing, in which:

figure 1a shows a spindle drive in a first position with a stop device according to a preferred

embodiment of the present invention;

figure 1b shows the spindle drive of figure 1a in a second position; and

figure 2 shows an enlarged view of the stop device according to the invention in the position shown in figure 1b.

Figure 1a shows a spindle drive with a preferred embodiment of the stop device according to the invention.

The spindle drive comprises a threaded spindle 1 and a spindle nut 2 with a stop 3. The stop device according to the invention comprises a limit stop 4 and also a faceplate 5 which is arranged between the stop 3 of the spindle nut 2 and the limit stop 4. The threaded spindle 1 and spindle nut 2 in the position shown in figure 1a are not in a limit stop position.

The limit stop position, or the position close to the limit stop position, of the threaded spindle 1 and spindle nut 2 is shown in the representation according to figure 1b.

The circular detail shown in figure 1b is represented on an enlarged scale in figure 2. The operation of the stop device according to the invention for a spindle drive will now be explained in more detail below with reference to figure 2.

The stop device according to the invention comprises - as already explained with reference to figure 1a - the limit stop 4 and the faceplate 5, the faceplate 5 being arranged between the stop 3 of the spindle nut 2 and the limit stop 4. According to the invention, the limit stop 4 and the stop 3 of the

spindle nut 2 are offset in relation to one another, and the stated stops can act according to the invention upon the faceplate 5 such that a bending moment can be applied to the faceplate 5 according to the invention in the limit stop position or in the position close to the limit stop position which is shown in figure 1b and in figure 2. The corresponding bending moment is illustrated in figure 2 by way of the opposing arrows. According to the invention, the faceplate 5 is preferably arranged perpendicularly to the axis defined by the threaded spindle 1. The stop 3 of the spindle nut 2 and the limit stop 4 are arranged coaxially about the axis defined by the shaft of the threaded spindle 1. As can be seen from figure 2, the stop 3 of the spindle nut 2 preferably has a first diameter which is larger than a second diameter of the limit stop 4. For reasons of higher stability and in order to take up particularly little overall space, the faceplate 5 can generally be mounted directly on the limit stop 4. Preferably according to the invention, the faceplate 5 consists of elastic material, particularly preferably of metal, especially preferably of spring steel. This provides a particularly stable and yet simple-to-implement way of supporting the forces which occur when the spindle nut 2 and threaded spindle 1 of the spindle drive shown are in the limit stop position, without the possibility of any destruction or damage occurring to the faceplate 5 according to the invention.

The stop device according to the invention for a spindle drive makes it possible to achieve low-noise operation for this spindle drive while nevertheless combining a small overall space requirement with a relatively simple construction.